INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION - 1960

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INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM-- SOVIET-BLOC ACTIVITIES

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Dobronravov Discusses Reason for Soviet Missile and Use of New Rockets

On 9 January, L'Humanite, Paris Communist daily newspaper, published an article on page 3 datelined Moscow, 8 January, which was telephoned to the newspaper by its Moscow correspondent, Max Leon. Leon reported that a few hours after the announcement of the forthcoming Soviet rocket tests in the Pacific, he was received by Prof Vladimir Dobronravov, who granted him a 2-hour interview for the benefit of L'Humanite readers. Dobronravov explained the object of the current experiments, what can be expected of them for the immediate future and for sending human beings into space, what the goal of the Pacific tests is, what the objectives of future giant satellites and heavy rockets are, and why man cannot yet be sent to the Moon.

Leon reported that Dobronravov answered that the tests, which will begin on 15 January, are experiments in launching Earth satellites and rockets whose weight is far greater than the weight of rockets launched previously, and that heavier cosmic rockets can accomplish the following tasks: (1) since they carry more scientific equipment, they can study in detail the regions in which the planets revolve and send back information to observation posts on Earth; "it is not excluded," Dobronravov said, "that they will photograph and send back pictures to our centers as Lunik III did"; and (2) with a heavy satellite, the problem of the return of cosmic vehicles to Earth can be solved; a whole space guidance system can be installed in a large satellite; by the same token, he said, "it is possible for us to equip it with engines and provide a fuel reserve which will make braking possible when the heavy sputnik enters the heavy strata of the atmosphere. Dobronravov added that this vehicle can be equipped with apparatus which will enable it to land without damage, and that heavy satellites such as these, which can be guided, are sufficiently large and perfected to carry telescopes and equipment for transmitting the observations made.

Returning to the subject of the cosmic rockets, Dobronravov said that what he said about heavy satellites can be applied to cosmic rockets. In the rockets, which are more powerful than those used up to now, guidance apparatus, better equipment to observe space in the regions where the planets revolve, and more perfected machines for the transmission of scientific data will be installed. They can, he said, be equipped with devices which will assure soft landings on the Moon and other planets, thus avoiding destruction of the vehicle on impact. "Finally," he said, "it is planned to equip them with everything necessary for them to resume their flight, leave the planets where they landed, and return to Earth."

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Dobronravov said that after the planned experiments, it will be possible to attempt the launching of the satellites and the cosmic rockets. It will be possible, he said, to place in orbit simultaneously heavy satellites which can be guided and made to return to Earth, to send to the moon a rocket which will become a Moon satellite, to study the lunar surface and the regions where the Moon moves, and to send a cosmic rocket toward other planets to study their physical nature and the "zone close to space. Naturally," Dobronravov said, "one day we will come to the flight of manned rockets. However, serious problems must be solved for this." He said that the rocket must be heavy enough and big enough to carry everything necessary for the crew during a long flight (which can last for years), propellants, and a fuel reserve. He said it is also necessary to determine definitively the danger of meteorites and cosmic rays. The launching of unmanned rockets will aid in this. The vehicles will be sent on different trajectories toward the same planets. The information they will provide will help the builders in the installation of protective devices and the calculation of the best trajectories, avoiding danger zones.

The necessity for preliminary experiments with powerful interplanetary rockets is easily explained. As the weight of the last stage is increased, the mass of the vehicle increases equally, but the precision with which the rocket must be placed in a chosen orbit must be still higher. "We must be certain," he said, "that the last stage of the rocket which carries the scientific equipment follows very precisely the chosen trajectory. So that they will not be lost, it is necessary to carry out tests with the rockets without the last stage."

The experiments which are going to be carried out will serve to verify the calculations about the first part of the flight, that is, the course over which the rocket's propellants are ignited one by one. The quality of the equipment and flight control [system] will also be checked on this part of the "powered phase."

"When the tests lead us to the conclusion that the calculations are correct, that the propellants of each stage, and the guidance system are functioning perfectly," Dobronravov concluded, " then we will proceed to the launching of a complete rocket. This will be the moment of experimentation for a vehicle whose goal is to transform itself into a lunar satellite or to reach other planets." ("Our Permanent Correspondent in Moscow, Max Leon, Telephones US: 'Professor Vladimir Dobronravov Told me that Heavy Sputniks Will Enable the Solution of the Problem of Return of Cosmic Rockets to Earth'"; Paris, L'Humanite, 9 Jan 60, p 3)

Prof Blagonravov Sees Pacific Tests as Forerunners of Mars and Venus Shots

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In a special interview with L'Humanite correspondent Pierre Juin, Professor Blagonravov, member of the Soviet delegation to the First International Space Science Colloquium in Nice, stated: "The forthcoming launching of Soviet superrockets over the Pacific will permit the substantiation of certain hypotheses, the confirmation of which will subsequently facilitate exploration toward Mars and Venus. It is not yet possible to confirm that a vehicle will be sent toward Mars this year, but it is obvious that everything is being done so that such a ballistic flight will be possible at the end of 1960, at a time when Mars will be at a relatively close distance to Earth. It will be in 1961 that Venus can be approached with the greatest chance of success."

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Discussing the danger of the radiation belts, Blagonravov said that he does not think they constitute a serious obstacle and concluded by saying, "If the zones of great concentration cannot be broken through in the equatorial regions, we will go via the poles!" ("At the International Space Colloquium: Venus? We Will Approach It in 1961, Soviet Professor Blagonravov Tells Us"; Paris, L'Humanite, 14 Jan 60, p 2)

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Future Prospects of Space Research Discussed by Academician

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"Scientific and technical progress is developing at an ever-increasing tempo. The Soviet Union with its artificial earth satellites and cosmic rockets has laid the path in space." Thus writes Academician V. Ambartsumyan, Academy of Sciences USSR, in a Pravda article.

Science's attempts to unravel nature's secrets are particularly intense in the direction of the physics of the cosmos he says. The question not only concerns the investigation of planets with the aid of rockets and interplanetary stations, in which the richest results are expected, but also the possibility of lifting astronomical instruments beyond the Earth's atmosphere into surrounding cosmic space for studying the more distant celestial bodies. This is extremely important, continues Ambartsumyan, since the investigation of the physical processes in distant stars and nebulae made up to now were, perforce, unilateral, inasmuch as the earth's atmosphere does not allow all of the complex of electromagnetic radiation to pass but only visible light and part of the radio spectrum. From cosmic space it will be possible to conduct observations in the entire spectrum with almost no limitations.

The development of radioastronomy in the last decade has enabled researchers to penetrate into the region of the most violent physical processes which come about in celestial bodies. Astronomical observations with artificial satellites and rockets are permitting to an ever greater

degree to further the knowledge of nonstationary physical processes where the deeper "fundamental" properties of matter develop many times more intensely than in our terrestrial laboratories.

The latest discoveries in the field of electronics have led to a manifold increase in the sensitivity of the usual telescopes. This means, says Ambartsumyan, that the most distant regions of the Universe will become accessible to direct observation from the Earth. New research techniques will undoubtedly expand our knowledge of the Great Universe, i.e. the system of galaxies surrounding us in which millions of star systems exist. ("New Secrets of the Universe Will be Revealed," by Academician V. Ambartsumyan; Moscow, Pravda, 30 Dec 59, p 5)

New Information on the Shape of the Earth

A value for the oblateness of the Earth has been successfully derived and the assymetry of the Earth relative to the equator has been established by Soviet scientists, reported Prof I. D. Zhongolovich at a conference in Moscow. These findings are based on observations of artificial Earth satellites. The conference, which drew about 30 scientists, representatives from the largest scientific institutions in the Soviet Union, also heard that the northern hemisphere was found to be more elongated than the southern. Previous data, in particular that according to Prof N. A. Kozyrev's theory, held that the southern hemisphere was more drawn out.

A number of other reports described new methods for the numerical solution of problems connected with studying the motion of artificial celestial bodies. They give great time saving in the solution of very complex equations of the motion of such bodies and ensure still greater accuracy in placing artificial celestial bodies in preselected orbits. ("New Information on the Shape of the Earth," by V. Arsent'yev, scientific associate of the State Astronomical Institute imeni P. K. Shternberg; Moscow, Sovetskaya Aviatsiya, 6 Jan 60, p 4)

II. SEISMOLOGY

Ten-Channel Seismoscope

This article gives a description and a circuit block diagram of a seismoscope with reduced power consumption and ten receiving channels which make it possible to obtain observation data simultaneously from ten points of a medium. The amplification factor of the input amplifier is 1,500,000. The pass-band width of the input amplifier is 500 cycles per second to one megacycle per second. The dynamic range of the output voltage of the amplifier is equal to 12 (in centimeters of the screen of the cathode-ray tube, type 31L033). The pulse which excites the crystal oscillator is square, has a voltage amplitude of 2,000 volts, and a width of 5-20 microseconds. The sweep time of the first tube is 20-3,000 microseconds, The reciprocal of the speed of the sweep is 0.8-120 microseconds per centimeter. The pulse repetition rate can be varied within the range 5-50 cycles per second. The time marks are calibrated in 5 and 10 microseconds. Every tenth pulse is increased in amplitude. ("Ten-Channel Seismoscope," by Ye. M. Averko; Leningrad, Vestnik Leningradskogo Universiteta, Seriya Fiziki i Khimii, No 3, 1959, pp 134-140)

III. OCEANOGRAPHY

Vityaz' Enroute to Ceylon

Operations in the eastern part of the Indian Ocean by the expeditionary ship Vityaz' have been completed according to a radio report from V. Bogorov, chief of the expedition and Corresponding Member of the Academy of Sciences USSR. The ship is now on its way to Colombo, Ceylon.

The work which is being conducted is part of international investigations of the world ocean. This is a continuation of the work of the recently ended IGY.

Bogorov reports that the Vityaz' visited the port of Freemantle, Australia, and Christmas Island. It is the first Soviet ship ever to visit this small island, says Bogorov. ("We Serve Science," by V. Bogorov; Moscow, Pravda, 6 Jan 60, p 6)

All-Union Plenum of the Oceanographic Commission of the Presidium of the Academy of Sciences USSR

The plenum of the Oceanographic Commission was held 5-10 January 1959.

More than 20 reports on the general problems of the Pacific Ocean and on some preliminary results of completed IGY work were read and reported. Great interest was aroused by the report of Prof A. G. Kolesnikov, Chair of the Physics of the Sea, Moscow State University, on the turbulent exchange in the sea with a nonhomogeneous density field, and of P. S. Lineykin, Doctor of Sciences, on the status of the problems of the theories and methods of studying ocean currents. The latter report indicated not only the direction which the theoretical studies of ocean currents have taken, but also how important defects have been discovered, implying criticism of the position taken by the associates of the Institute of Oceanology, Academy of Sciences USSR, who have overrated the actual value of the concept of "total flow" in the emergence of currents, the use of density models to compute the current components, and the principles of using models of currents in the open seas.

A lively discussion followed the report by V. A. Zenin, Candidate of Sciences, which dealt with methods of oceanographic research, suggesting a unified system of organizing and conducting oceanographic observations in order to apply the obtained data to devise special aids, to check scientific hypotheses and theories, and to develop computing methods and marine prognoses.

V. G. Bogorov, Corresponding Member, Academy of Sciences USSR, reported on the geographic zonality of the central parts of the Pacific Ocean. Using factual material collected in 1957-1958 on board the ship Vityaz', the author covered the regions of the Pacific Ocean between 40 N and 40 S, outlining the position and boundaries of geographic zones; showing the interaction of various physical, chemical, biological, and geological processes characteristic for each zone; and giving the phenomena which are part of the ocean in general. P. L. Bezrukov reported on some problems of zonality in the formation of precipitations in the Pacific Ocean, and A. P. Lisitsin reported on the suspension of matter in the ocean.

The plenary sessions also discussed short reports which had been submitted by the Section on Basins and reports on modern oceanographic vessels. A. A. Yakovlev reported on a projected research vessel for use in the Soviet Arctic at any distance from shore in both floating and solid ice fields. The vessel will travel independently over distances of 13,000 miles and for as long as 120 days. It will carry 40 expeditionary staff personnel, equipment equivalent to that of 12 scientific laboratories, and other special accommodations for navigation, hydroacoustics, etc. On the basis of information on foreign research-vessel construction, the projected Arctic vessel will be completely modern with respect to research facilities.

More than 60 reports were heard at the meetings of the sections on physical oceanography and meteorology, marine geology of shores and river mouths, and biology and chemistry of the sea. Special interest was shown in reports by K. M. Kreps on the problems of the radioactive contamination of oceans and marine organisms; B. A. Nelepo, Moscow State University, on a direct method of determining radioactivity of seawater in the Antarctic sector of the Pacific Ocean; by N. A. Panteleyev on the results of research on turbulence in the surface layer of Antarctic waters of the Indian and Pacific Oceans with the newly devised turbulence meter, which records the fluctuations of temperature and of the horizontal and vertical components of the velocity of flow; by G. G. Khundzhu, on the investigations of temperature and salinity of the waters of the Antarctic sector of the Pacific Ocean with a new instrument, the "bathythermohalinograph," developed by the Chair of Physics of the Sea, Moscow State University.

Among the many reports on the geology, chemistry, and biology of the sea, which were based on recent research in various areas, were the reports of M. V. Klenova, on the geology of the Atlantic Ocean; of N. A. Belov and N. N. Lapina, on the relief and bottom conditions of the Central Arctic; of A. V. Zhivago, on genetic types of bottom relief in the Southern Indian and Pacific Oceans; and of Ye. I. Gal'perin, on a study of the earth's crust in the transition zone from the Asian continent to the Pacific Ocean.

Those participating in the sessions included representatives of scientific research institutes, higher educational institutions, of the chief of the Naval Staff, of the Hydrographic Department of the Navy, of the Main Administration of the Northern Sea Route, of the Hydrometeorological Service, the fishing industry, and other research and production organizations. ("All-Union Plenum of the Oceanographic Commission," by A. A. Dmitriyeva; Leningrad, Vestnik Leningradskogo Universiteta, No 18, Seriya Geologiya i Geografii, No 3, 1959, pp 136-137)

IV. GLACIOLOGY

Glaciological Studies During IGY Reveal Diminishing Glaciation

The study of the perpetual ice and snow on the Earth was conducted during the IGY. There were 26 countries engaged in glaciological investigations. The greatest volume of this work was fulfilled by Soviet and US glaciologists.

Up to the time of the IGY, data on the area occupied by glaciers on Earth was only approximate and inaccurate. It was thought, for example, that the thickness of Antarctica's ice cover was about 600-800 meters. Measurements during the IGY indicated that the average thickness of Antarctic ice was close to 2,000 meters and sometimes reached 4,000 meters.

The presence of glaciation affects a number of natural phenomena. It is only necessary to point out that modern glaciation covers an area of over 15 million square kilometers, which is about 10 percent of the earth's land area. The mass of water contained in glaciers and only slightly entering into the water cycle of the Earth is estimated at approximately 22 million cubic kilometers. For comparison, all surface land waters amount to only 2 million cubic kilometers.

Glaciers are a unique accumulation of cold and moisture and exert a considerable influence on the climate of neighboring regions and on the Earth as a whole. Glaciation of the Earth is not constant, but increases and decreases.

It is felt that on the basis of the material of glaciological research accumulated during the IGY, it will be possible, finally, to obtain new and basic data on the interaction of glaciation and climate, on the direction of evolving contemporary glaciation, of its role in the water cycle of the Earth, etc. It can already be confidently stated that in our day, glaciation on the Earth is on the whole, declining. ("Useful Investigations," by Prof G. Avsyuk, Doctor of Geographical Sciences, Chairman of the Working Group on Glaciology of the IGY; Moscow, Pravda, 29 Dec 59, p 6)

Curvilinear Profiling in Seismic Glaciology

In that part of the glaciological program of the IGY dealing with a determination of the thickness and the elastic properties of glacier ice, the presence of deep-seated transverse crevices and strong currents of melt water at the surface of the high altitude glaciers, where an inadmissibly high level of microseisms was observed, encumbered the continuous tracing of reflected and refracted waves along a straight-line route.

It was found that, under such circumstances, an uninterrupted seismoprofiling is possible only along a curvilinear profile of arbitrary form. Any curvilinear profile of reflected or refracted waves may be considered a combination of elementary, nonlongitudinal, straight-line profiles; thus, under favorable seismological conditions, curvilinear segments of a profile afford a possibility of producing a three-dimensional interpretation of the results of observations (Kravtsov, G. S., "Curvilinear Seismic Profiles in the Reflected Wave Method," Uchenyye Zapiski TGU, No 34, Tomsk, 1958; Kravtsov, G. S., "Results of Seismic Research on the Malyy Aktru Glacier in Central Altay in 1957," Materialy MGG po Glytsiol. Issled. [in print]).

This article investigates certain problems of the method of curvilinear profiles of refracted waves of arbitrary form. In contrast to the well-known earlier rigorous solutions of three-dimensional problems, requiring complete and rather complex systems of field observations, the procedure proposed here is based on a plotting of surface hodographs of refracted waves according to a system of curvilinear profiles of arbitrary form and is sufficiently accurate for practical calculations under ordinary geological conditions.

Theoretically strict solutions of three-dimensional problems require a complete and sometimes rather complex system of observations. On high-altitude glaciers, the practical realization of such systems is either not possible or involves considerable technical difficulties. The method of curvilinear seismic profiling, to a certain degree, eliminates these difficulties, but also reduces the accuracy of the structural-geological plottings. This is not inevitable, however, since accurate procedures of plotting and interpreting the surface hodographs of refracted waves according to a system of one curvilinear profile may be worked out for a limited class of seismogeological conditions. Ordinary calculations show that under favorable conditions, the degree of approximation of surface hodographs of refracted waves by families of focused elliptical isochrons is sufficient for a practical utilization of the curvilinear method in the investigation of high altitude glaciers up to 300 meters thick. This was graphically demonstrated by field tests of the method on the high altitude glaciers of Central Altay (Informatsionnyy Byulleten' MGG, No 1, 1957). ("The Use of Curvilinear Profiles of Refracted Waves in the Seismic Study of Glaciers," by G. S. Kravtsov, Tomsk State University; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Geologiya i Razvedka, No 11, Nov 58, pp 101-112)

V. ARCTIC AND ANTARCTIC

Soviets Report Finding Ancient Spores in Antarctic

O. S. Vyalov, member of the Academy of Sciences Ukranian SSR, during his stay in Antarctica, collected a number of specimens of crystalline rocks, both from bedrock outcrops as well as from moraine boulders. In the summer of 1956, several of these samples were submitted to B. V. Timofeyev for paleontological analysis. One of the samples was found to contain a noticeable quantity of spores. A verifying analysis was made. The actual presence of a whole series of spores was verified and it was decided to publish information concerning them.

In the specimen of plagioamphibolic gneiss from the moraine at Station Mirnyy, ten types of spores were identified by B. V. Timofeyev, who also established the presence of unidentifiable fragments of tissue of plant origin.

All of the forms are known from the ancient rock of the Siberian Platform ranging from the Proterozoic to the Lower Cambrina. Only one species, the Ocridoligotriletum Kryshtofovichi (questionably identified because of poor preservation) occurs in the Riphaeian and Cambrian.

The morainic material in Queen Mary Land comes from rocks of the East Antarctic platform foundation and to a slight extent from its sedimentary mantle. The mantle rocks, both of the Sandow suite Upper Proterozoic or of the Lower Paleozoic ages, and particularly the Beacon suite (Devonian--Permian), differ greatly from the foundation rock by having a very slight degree of metamorphosis. The spore-containing gneiss is said to undoubtedly belong to the crystalline foundation. The age limits determined by the spores, it is felt, should be confined to the Proterozoic. ("First Find of Ancient Spores in Antarctica," by O. S. Vyalov and B. V. Timofeyev, Institute of Geology and Mineral Resources, Academy of Sciences Ukrainian SSR; Kiev, Dopovidi Akademii Nauk Ukrains'koi RSR, No 10, 1959, pp 1,133-1,135)

South Pole Expedition Returning to Vostok

The Soviet sled tractor expedition which arrived at the South geographic pole on 26 December, began its return trip to Station Vostok on 29 December at 1500 hours. The expedition conducted scientific investigations during its stay at the pole. Most interesting of these are the seismic sounding of the thickness of the continental ice and temperature measurements in its mass. A special hole is drilled in the glacier sheet for making such studies. ("From the Pole--On the Return Trip"; Moscow, Pravda, 30 Dec 59, p 6)

Soviet Expedition Completes Trek in Central Antarctic

The sled-tractor train expedition led by A. Dralkin, chief of the Fourth Soviet Antarctic Expedition, returned from the south geographic pole to the south geomagnetic pole, where Station Vostok is located, on 8 January at 0730 hours Moscow time.

Dralkin, in a radio report from Antarctica, gives the following information on the trip.

During the stay at the South geographic pole, the expedition conducted various scientific observations. Seismic sounding of the ice dome showed that the bedrock was located 2,800 meters under the ice here. This is exactly at sea level. [This is in contradiction to a previous radio report by Dralkin from Amundsen-Scott station at the south geographic pole that the bedrock at this point is 1/4 kilometer higher than sea level. This report was published in Izvestiya, 29 December 1959, p 6. The height of the station was given as 2,765 meters above sea level and the thickness of the ice as over 2,500 meters.]

Before leaving the pole, the members of the expedition and the personnel of Amundsen-Scott station held a farewell ceremony at which the flag of the Soviet Union was raised.

The return trek to the south geomagnetic pole covered 1,200 kilometers. This trail was already marked by ruts previously made by the over-snow vehicles and pyramids of empty fuel drums at stopping places. Rough travel made it impossible for the scientific associates on the expedition to process the results of the investigations except during stops. The return trip was made in clear, cloudless weather with good visibility and an absence of strong winds. The train traveled from 80-180 kilometers a day. ("From Pole to Pole," by A. Dralkin, chief, Fourth Soviet Antarctic Expedition; Moscow, Pravda, 9 Jan 60, p 4)

Fifth Antarctic Expedition Arrives at Mirnyy

The Kooperatsiya carrying members of the Fifth Soviet Antarctic Expedition, an American, two Czechs, and three East German scientists, arrived at Mirnyy, the Soviet South Pole observatory. The diesel-powered ship was moored near the shore ice about 11 miles from the mainland.

Two hours after the ship's arrival, unloading of personnel, equipment, supplies, etc, was begun with the aid of airplanes. ("Diesel Ship Kooperatsiya Has Arrived at Mirnyy"; Moscow, Pravda, 8 Jan 60, p 6)

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